



ON APPEAL TO THE U.S. PATENT AND TRADEMARK OFFICE

BOARD OF PATENT APPEALS AND INTERFERENCES

Applicant: Ionel D. Jitaru : Examiner: Riley, Shawn
Serial No.: 10/509,983 : Art Unit: 2838
Filed: April 21, 2005 :
Title: **METHOD AND APPARATUS FOR CONTROLLING A
SYNCHRONOUS RECTIFIER**

LETTER ACCOMPANYING APPELLANT'S APPEAL BRIEF

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

Enclosed are three copies of Appellant's Appeal Brief under 35 U.S.C. § 134(a) in the application identified above.

No extension of time is believed necessary for the filing of the enclosed. However, in the event that an extension of time is found to be needed, applicant requests that extension and authorizes the U.S. Patent and Trademark Office to charge the deposit account 070135 of the undersigned. Copies of this page are enclosed.

Respectfully submitted,

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Date: February 27, 2008

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APPELLANT'S APPEAL BRIEF

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APPELLANT'S APPEAL BRIEF

This is Appellant's Brief on Appeal pursuant to 35 U.S.C. § 134(a). The following sections of this Brief are the items set forth in 37 C.F.R. § 41.37(c).

Real Party in Interest (37 C.F.R. § 41.37(c) (1) (i))

DET International Holding Limited, a Cayman Islands corporation and assignee of the inventor Ionel D. Jitaru, is the real party in interest.

Related Appeals and Interferences (37 C.F.R. 41.37(c) (ii))

There are no related appeals or interferences. Presently pending is Appellant's Petition to the Director of the U.S. Patent and Trademark Office requesting reversal of a restriction requirement and the withdrawal of claims 18 - 30 from examination, and requesting the withdrawal of the making "final" of the Official Action of June 27, 2007.

Status of Claims (37 C.F.R. § 41.37 (c) (iii))

Claims 1 - 8, 10 - 13 and 15 - 30 are present in this application. Claims 18 - 30 stand withdrawn by the examiner. Claims 1 - 8, 10 - 13 and 15 - 17, are the claims on appeal. These are all of the claims not withdrawn from examination in this application. Each of claims 1 - 8, 10 - 13 and 15 - 17 are under final rejection. The claims on appeal are appended at Appendix A.

Status of Amendments (37 C.F.R. § 41.37(c) (iv))

There has been no amendment of the application subsequent to the final rejection dated June 27, 2007.

Summary of Claimed Subject Matter (37 C.F.R. § 41.37(c) (1) (v))

The independent claims involved here are claims 1 and 15. without limiting the interpretation of the claims to the specific elements of any exemplary embodiment described in the specification, the following explains the independent claims' subject matter with reference to the specification and drawing figures.

Claim 1

Independent claim 1 is directed to "a power converter for supplying an output power to a load." Figs. 6a and b depict one of several exemplary embodiments of such a converter described and illustrated in this application. See the brief description of Figs. 6a and b, page 6, lines 22 and 23, and see page 9, line 24.

The converter of claim 1 has "a switching device," such as the synchronous rectifier SR of Fig. 6a, page 9, line 29 - page 10, line 1.

The switching device claimed has "a switching input, a switching output, and a control input for enabling or disabling said switching device from conducting current from said switching input to said switching output." In Fig. 6a current input to the synchronous rectifier ISR is shown and an output connection to the winding L_2 of the transformer T is shown and a "control input" is shown connected to the control circuit "CC." The signal V_{c-SR} enables and disables the conduction of the current ISR through the switch as illustrated in Figs. 7e and 7F, page 10, line 27 - page 11, line 2.

The converter of claim 1 has "a network wherein said switching device input, said switching device output, and the load are connected together in a circuit." In Fig. 6a, the network includes the synchronous rectifier SR input and output as described above the load R_L , the capacitor C, the Schottky diode D and the secondary winding L_2 . Page 9, line 27 - page 10, line 10.

As called for in claim 1, the Fig. 6a exemplary embodiment has, at LB, "a bias winding in said circuit for producing a bias voltage," such as VB. Page 10, lines 10 and 11, page 13, lines 7 - 8, 19 - 27.

Finally, claim 1 calls for "a control circuit for (a) determining the rate of change of said bias voltage, (b) characterizing said rate of change, and (c) controlling said control input as a result of the characterization (b)." In the Fig. 6a embodiment, the control circuit is shown at CC. Page 10, lines 1 - 3. Fig. 8 shows an exemplary control circuit CC that provides the converter operation indicated graphically in the voltage and current plots in Fig. 7. Operation is explained at page 12, lines 3 - 29. It is pointed out that the rate of change of the secondary voltage VSEC is determined by comparison with a threshold voltage VTH by a comparator 100 during a delay period while VC-SW is low. If the secondary voltage VSEC exceeds VTH before the delay period ends, then the rate of change of VSEC is characterized as sufficiently high to warrant turning on the synchronous rectifier SR of Fig. 6a by the control signal VC-SR generated at the output of the AND gate 110 in the Fig. 8 control circuit. Page 12, lines 16 - 24. If VSEC stays lower than the threshold voltage VTH during the delay period, then the rate of change VSEC is characterized as sufficiently slow to warrant not turning on the synchronous rectifier SR of Fig. 6a. Page 12, lines 25 - 29. As explained at page 14, lines 5 - 12, preferably the bias voltage VB of the bias winding LB is compared to the threshold voltage VTH rather than the full secondary voltage VSEC.

Further embodiments of the invention used in various types of power converters are illustrated in Figs. 9a and b, described at page 19, lines 17 - 29, Fig. 10a, described at page 14, line 28 to page 16, line 20, Fig. 11a, described at page 16, line 21 to page 17, line 25, and Fig. 12a, described at page 17, line 26 to page 16, line 16.

Claim 15

Independent claim 15 calls for:

In a power converter, a method for supplying an output power to a load, comprising the steps of:

Figs. 6a and b, the voltage and current plots of Fig. 7 and the control circuit of Fig. 8 depict the exemplary embodiment of a power converter and its operation in the method of independent

claim 15. This operation is described at page 9, line 23 to page 14, line 12. The converter supplies power to the load R_L . Page 9, lines 27 - 29.

The method comprises the step of "providing a power input portion." See V_{IN} and the portion of the converter of Fig. 6a connected on the primary side of the transformer T, page 9, lines 27 - 29.

The method of claim 15 includes "providing a power output portion comprising a switching device having a switching input, a switching output, and a control input for enabling or disabling said switching device from conducting current from said switching input to said switching output." The synchronous rectifier SR of Fig. 6a is such a switching device. Page 9, line 29 to page 10, line 1. In Fig. 6a a current input to the synchronous rectifier ISR is shown, an output connection to the winding L_2 of the transformer T is shown and a "control input is shown connected to the control circuit "CC." The signal VC-SR enables and disables the conduction of current ISR through the switch, all as claimed in claim 15.

As called for in claim 15, the control circuit CC of the converter of Fig. 6a provides the step of "determining the rate of change of said bias voltage." Fig. 8 shows an exemplary control circuit CC that provides the converter operation indicated as shown in Fig. 7. Operation is explained at page 12, lines 3 - 29. It is pointed out that the rate of change of the secondary voltage V_{SEC} is determined by comparison with a threshold voltage V_{TH} by a comparator 100 during a delay period while VC-SW is low.

The control circuit of Fig. 8 "characterizes" the "rate of change" as illustrated in Figs. 7e and 7f, page 10, line 27 to page 11, line 2.

The claim 15 method further includes providing a "network wherein said switching device input, said switching device output, and the load are connected together in a circuit." In Fig. 6a, the network includes the synchronous rectifier SR input and output as described above the load R_L , the capacitor C, the Schottky diode D and the secondary winding L_2 . Page 9, line 27 to page 10, line 10.

Claim 15 calls for "providing a bias voltage representative of the output power." As called for, the Fig. 6a exemplary embodiment has, at LB, a bias winding LB supplying a bias voltage VB. Page 10, lines 10 and 11, page 13, lines 7 - 8, 19 - 27.

As called for in claim 15, the control circuit CC of the converter of Fig. 6a provides the step of "determining the rate of change of said bias voltage." If the secondary voltage VSEC exceeds VTH before the delay period ends, then the rate of change of VSEC is characterized as sufficiently high to warrant turning on the synchronous rectifier SR of Fig. 6a by the control signal VC-SR generated at the output of the AND gate 110 in the Fig. 8 control circuit. Page 12, lines 16 - 24. If VSEC stays lower than the threshold voltage VTH during the delay period then the rate of change VSEC is characterized as sufficiently slow to warrant not turning on the synchronous rectifier SR of Fig. 6a. Page 12, lines 25 - 29. The control circuit of Fig. 8 "characterizes" the "rate of change" as called for in claim 15. Thus the "control input" is controlled "as a result of said step of characterizing" as called for in claim 15. As explained at page 14, line 5 - 12, preferably the bias voltage VB of the bias winding LB is compared to the threshold voltage VTH rather than the full secondary voltage VSEC.

Grounds of Rejection to be Reviewed on Appeal (37 C.F.R. § 41.37(c) (1) (vi))

Claims 1 - 8, 10 - 13 and 15 - 17 stand rejected as anticipated by the U.S. patent No. 5,757,627 to Faulk dated May 26, 1998 ("the Faulk patent") under 35 U.S.C. § 102(b). the Faulk patent is attached for the Board's convenience at Appendix C.

Argument (37 C.F.R. § 41.37(c) (1) (vii))

The invention of this application relates to a switched mode power converter having, in its output section, a controlled switching device that is enabled when load increases, but that is disabled when load is light. Preferably, the switching device is a synchronous rectifier controlled by a control circuit that enables the synchronous rectifier in response to a rapid rate of increase of a bias voltage on a bias winding indicating an increasing load. The advantages of the apparatus and method of operation in the above fashion is set forth most succinctly at page 9, line 29 to page 10, line 7 of the application:

The present invention provides the benefits of using synchronous rectifiers as secondary switches during normal load conditions. In addition, the present invention allows for the use of either parallel diodes or body diodes during light load conditions. The present invention protects against reverse current flow during light load conditions because the reverse current must be driven by a voltage that exceeds the diode cut-in voltage. Thus, in situations where two or more switch mode converters are connected in parallel to supply a single load and the output of one converter is at a slightly lower output voltage than the others, current will not flow into the lower voltage converter in reverse because the voltage difference would normally not be sufficient to overcome the diode cut-in voltage.

Claims 1 and 15 Are Patentable Over the Faulk Patent

It is axiomatic that a claim rejection for anticipation by a prior art patent under 35 U.S.C. § 102(b) requires every element of the rejected claim to be found in the relied-upon prior art patent. *Gechter v. Davidson*, 116 F.3d 454, 1457, 43 U.S.P.Q. (BNA) 2d 1030, 1032 (Fed. Cir. 1997).

The Faulk patent fails to anticipate both of claims 1 and 15 in much the same manner. The Faulk patent fails to disclose a control circuit that determines the rate of change of a bias voltage produced by a bias winding as claimed in claim 1. Similarly the Faulk patent fails to disclose the step of determining the rate of change of a bias voltage representative of output voltage as claimed in independent method claim 15.

The Faulk patent, attached as Appendix C, discloses a power transformer 100 with a master controller 144 for controlling the secondary switch 116 and a slave controller 142 for controlling the primary switch 110. The transformer further includes auxiliary windings 136 and 278 that are connected to the controllers. The master controller 144 monitors the zero crossing of the secondary current through the transistor 152 and monitors the DC input voltage V_{in} through the auxiliary winding 136 (Faulk, col. 7, lines 55 - 61).

Contrary to the invention, as claimed in independent claims 1 and 15, Faulk neither discloses that the control circuit determines the rate of change of the voltage of the auxiliary winding nor that either of the switches 110 and 116 is controlled in dependency of this rate of change. Since Faulk does not disclose at least one of the main features of the invention, the

invention is neither anticipated by Faulk nor is it rendered obvious for one skilled in the art. Claims 1 and 15 should therefore be found patentable over Faulk. Claims 2 - 8 and 10 - 13 depend from claims 1 and claims 16 - 17 depend from claim 15. They are therefore patentable over Faulk as well.

In the final rejection the examiner equates Faulk's primary side switching device 110 to the switching device of claims 1 and 15. In this regard, referring to applicant's pointing out that the switching device 110 is not controlled in the above manner, in the final Official Action it is stated, "the drain of the MOSFET happens to be connected to the bias winding which therefore functions as stated in the paragraphs indicated previously." However, this is incorrect. As is apparent in both Figs. 1 and 3A of Faulk the drain of the MOSFET switch 110 is connected to the primary winding 102, not to either of winding 278 or 136 that the examiner has identified as bias windings.

Responding to applicant's previous explanation that Faulk's auxiliary primary winding 278 is a part of the circuit provisions supplying power to the slave controller 142 (Fig. 3A) and not a control for the switching device 110, the final Official Action states, at page 3, "278 directly measures a ratio of the output voltage and thereby produces a bias voltage representative of the output power and feeds directly back into the control circuit via at least 260." But this is incorrect. Faulk's transistor 160 connects the primary auxiliary winding 278 to the Vcc pin of the integrated circuit 142. This pin is not a control pin but a power supplying pin whereby the IC is provided power. At col. 11, lines 46 - 63, Faulk states:

During power up, power is supplied to the slave controller 142 through bleed resistor 268 and bleed resistor 266. The peak detector circuit 148 supplies power to the slave controller 142 after the slave controller 142 has powered up. The input of peak detector circuit 148 is connected to a primary auxiliary winding 278. A Zener diode 272 ensures a capacitor 274 will not be discharged during the off-time of transistor 110. One end of auxiliary winding 278 is connected to one end of a resistor 270 and the other end of auxiliary winding 278 is connected to primary side ground; the other end of resistor 270 is connected to the cathode of diode 272; the anode of diode 272 is connected to one end of capacitor 274, one end of a resistor 276, the anode of Zener diode 262, and the drain of transistor 260; the other end of capacitor 274 is connected to primary wide ground; the other end of resistor 276 is connected to primary side ground; and the cathode of Zener diode 262 is connected to the supply voltage for slave controller 142.

This is clearly contrary to the contention in the final Official Action and makes it clear that the winding 278 does not provide a control function for the transistor 110.

In particular then, comparing the independent claims in this application with the Faulk patent, claim 1 calls for:

- a bias winding in said circuit for producing a bias voltage representative of the output power; and
- a control circuit for (a) determining the rate of change of said bias voltage, (b) characterizing said rate of change, and (c) controlling said control input as a result of the characterization (b).

Claim 15 calls for:

- providing a bias voltage representative of the output power;
- determining the rate of change of said bias voltage;
- characterizing said rate of change; and
- controlling said control input as a result of said step of characterizing.

None of these provisions is taught by Faulk. The rejection of these claims 1 and 15 as anticipated by Faulk is in error. Reversal of this rejection at this time is in order it is respectfully submitted and these claims should now be allowed.

Dependent Claim 2

Claim 1 sets forth "a network wherein said switching device input, said switching device output, and the load are connected together in a circuit," and independent claim 15 is similarly limited. Properly construed, this circuit is also not present in the Faulk patent. (Another reason the Faulk patent does not anticipate claim 1 or claim 15.) With respect to this circuit, claim 2 clearly further differs from Faulk, placing the circuit referred to in claim 1 in the "power output portion" of the power converter. Any circuit of Faulk that includes the transistor 110, equated to the switching device of claim 1, is not in the output portion of Faulk's converter. It is on the primary or input side of Faulk's transformer 100. Claim 2, then, further differs from Faulk in this respect and the rejection for anticipation is in error for this reason as well as for the claim's dependency. The rejection should be overturned.

Dependent Claims 3 and 4

Dependent claims 3 and 4 stand or fall with claim 2.

Dependent Claim 5, 6, 7, 8 and 16

Claims 5, 6, 7 and 8, dependent from claim 1, 2, 3 and 4, respectively, further define the "determination" of rate of change of bias voltage of claim 1 and further define the "characterization" of the rate of change of claim 1, thus:

said control circuit is adapted so that the determination (a) includes comparing said bias voltage at a selected time relative to a selected starting value of said bias voltage, and so that the characterization (b) includes comparing the change in said bias voltage in (a) to a reference.

Nothing in the Faulk patent anticipates these additional limitations and claims 5, 6, 7 and 8 are patentable over the Faulk patent for this reason as well as by their dependence.

For the same reason claim 16 further patentably differs from Faulk than claim 15 from which it depends. The rejection of claim 16 should, accordingly, be overturned.

Dependent Claims 10, 11, 12, 13 and 17

Claims 10, 11, 12 and 13 stand or fall with claims 5, 6, 7 and 8, respectively, from which they depend.

Dependent claim 17 stands or falls with claim 16, from which it depends.

Conclusion

Because all of claims 1 - 8, 10 - 13 and 15 - 17 contain elements and limitations not present in the Faulk patent, the rejection of these claims as anticipated by Faulk is in error. That rejection should be reversed and these claims should now be allowed.

Respectfully submitted,

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APPENDIX A:

1. (Original) A power converter for supplying an output power to a load, comprising:

a switching device having a switching input, a switching output, and a control input for enabling or disabling said switching device from conducting current from said switching input to said switching output; and

a network wherein said switching device input, said switching device output, and the load are connected together in a circuit;

a bias winding in said circuit for producing a bias voltage representative of the output power; and

a control circuit for (a) determining the rate of change of said bias voltage, (b) characterizing said rate of change, and (c) controlling said control input as a result of the characterization (b).

2. (Original) The power converter of claim 1, further comprising a power input portion and a power output portion for providing said output power, wherein said circuit is in said power output portion.

3. (Original) The power converter of claim 2, further comprising a connecting portion for coupling said power input portion to said power output portion, wherein said connecting portion includes an inductor as part of said power output portion, wherein said bias winding is coupled in series with said inductor.

4. (Original) The power converter of claim 3, wherein said connecting portion includes a transformer having a primary winding as part of said power input portion and a secondary winding which includes said inductor.

5. (Original) The power converter of claim 1, wherein said control circuit is adapted so that the determination (a) includes comparing said bias voltage at a selected time relative to a selected starting value of said bias voltage, and so that the characterization (b) includes comparing the change in said bias voltage in (a) to a reference.

6. (Original) The power converter of claim 2, wherein said control circuit is adapted so that the determination (a) includes comparing said bias voltage at a selected time relative to a selected starting value of said bias voltage, and so that the characterization (b) includes comparing the change in said bias voltage in (a) to a reference.

7. (Original) The power converter of claim 3, wherein said control circuit is adapted so that the determination (a) includes comparing said bias voltage at a selected time relative to a selected starting value of said bias voltage, and so that the characterization (b) includes comparing the change in said bias voltage in (a) to a reference.

8. (Original) The power converter of claim 4, wherein said control circuit is adapted so that the determination (a) includes comparing said bias voltage at a selected time relative to a selected starting value of said bias voltage, and so that the characterization (b) includes comparing the change in said bias voltage in (a) to a reference.

10. (Original) The power converter of claim 5, wherein said characterization (b) includes determining whether the rate of change is either high or low compared to said reference.

11. (Original) The power converter of claim 6, wherein said characterization (b) includes determining whether the rate of change is either high or low compared to said reference.

12. (Original) The power converter of claim 7, wherein said characterization (b) includes determining whether the rate of change is either high or low compared to said reference.

13. (Original) The power converter of claim 8, wherein said characterization (b) includes determining whether the rate of change is either high or low compared to said reference.

15. (Original) In a power converter, a method for supplying an output power to a load, comprising the steps of:

providing a power input portion;

providing a power output portion comprising a switching device having a switching input, a switching output, and a control input for enabling or disabling said switching device from conducting current from said switching input to said switching output, and a

network wherein said switching device input, said switching device output, and the load are connected together in a circuit;

providing a bias voltage representative of the output power;

determining the rate of change of said bias voltage;

characterizing said rate of change; and

controlling said control input as a result of said step of characterizing.

16. (Original) The method of claim 15, wherein said step of determining includes comparing said bias voltage at a selected time relative to a selected starting value of said bias voltage, and wherein said step of characterizing includes comparing the change in said bias voltage in said step of determining to a reference.

17. (Original) The method of claim 16, wherein said step of characterizing includes determining whether the rate of change is either high or low compared to said reference.